Successes and Pitfalls of an E-commerce Implementation: The BHP Steel experience

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Abstract

The BHP Steel has been long recognised as one of the leaders in Australian E-commerce initiatives. This paper examines the E-commerce implementation process within this organisation and draws conclusions about ways in which large companies can optimise their E-commerce implementations. The findings from BHP Steel’s four major E-commerce projects over a significant period from the mid-1980s to the present suggest that the E-commerce implementation process is not straightforward, but rather a learning process. Through a number of years, the company has learnt to handle the technology, management and, more importantly, the business aspects of the implementation. This paper concludes by suggesting that although there are both technical and organisational factors which play a role in the success of E-commerce implementation in large companies, the willingness and cooperation of both parties involved in the E-commerce implementation process are the key indicators of the success of the implementation.

1. Introduction

Electronic Commerce is defined broadly as a new way of doing business using computer and telecommunications networks (Kalakota & Whinston, 1996). Wigand (1997) defines E-commerce in more detail as denoting: “the application of information and communications technology from its point of origin to its endpoint along any portion of the entire value system of business processes conducted electronically in combination with manual processes designed to enable the accomplishment of (or a part of) a business goal”.

These definitions make it clear that E-commerce implementation involves the use of computer and telecommunications technologies to improve business processes. In many organisations, however, implementing E-commerce requires management and staff to deal with quite new technologies, applications and processes. A whole range of technological, management and business issues arise during the implementation and need to be addressed.
In most organisations, information systems are used to provide cost savings (Meier 1992) by allowing the company to reduce inventory; streamline business processes and operations; integrate billing and payments systems into supply chain management; and improve customer service (Bolisani and Scarso 1998). The business functions supported by E-commerce technologies and applications are extremely varied and include manufacturing/production, sales and marketing, finance and accounting. Yet there is still little empirical research evidence available concerning the stages and processes involved in implementing E-commerce solutions within organisations.

Much previous research into the wider field of IS implementation has been based on the theories of change management or innovation diffusion (see Chan and Swatman 1999). This research discusses this issue and describes the IS implementation process in a number of stages, identifying the factors influencing the success or failure of the implementation). These studies have a number of limitations for researchers into E-commerce implementation:

- While E-commerce is unquestionably a type of IS, there are specific problems and issues which would not generally arise in the wider group of information systems implementation;
- Where a number of factors that influence IS implementation success have been identified, the majority of the studies use quantitative methods, such as surveys, to identify these factors. Although this approach provides a broader coverage and offers the benefits of generalisation, it also limits our understanding of what actually happened and how to overcome those problems which did arise.

In this paper, therefore, we present a case study of E-commerce implementation in a large Australian company, BHP Steel. We discuss issues associated with the implementation process in this organisation, which has been implementing different stages E-commerce for more than 10 years. Although a single case study has limited generalisability, we believe that a revelatory example such as this (Yin, 1989) can provide both an initial discussion point for further research, as well as providing insight into the problems faced by this innovative organisation.

2. Company and sector background

BHP (Broken Hill Proprietary Company Limited) is Australia’s largest company with significant international interest in Steel, Minerals, Copper and Petroleum. It also has major associated interests in services companies such as Engineering, Transport, and Information Technology. Established in 1885 at Broken Hill in New South Wales, Australia, BHP is a public company that has a board of directors which makes major
decisions about the future directions of the company. Employing over 60,000 people and operating in more than 60 countries.

BHP Steel is one of BHP’s major businesses. It is a steel manufacturer that produces a wide variety of steel products such as steel slabs, steel plate, rolled steel as well as pre painted steel. The following facts are presented to describe this particular manufacturing company:

- It is the leader in coating steel technologies, with a range of metallic coated and painted steel being manufactured worldwide.
- It has around 30,000 employees in total. There are four integrated Steelworks located in Port Kembla (7500 employees), Newcastle (1500 employees), Whyalla (1000 employees) and New Zealand (1000 employees), electric arc furnace steel-makings in Sydney (NSW) and Delta, Ohio (USA), iron ore mines in Australia, Ironsands mines in New Zealand, and a series of rolling, coating and painting facilities throughout Australia and the Pacific Rim.
- It produces over 8.2 million tonnes of steel per year that make it the thirteenth largest steel producers in the world.
- Its annual sales amounting to A$7.6 billion (BHP Steel 1997).
- Around 40% of its products are exported to 36 countries making it one of the world’s largest exporters of steel products.
- It has 240 businesses in 27 countries.
- It has trading relationship with around 40 suppliers as well as more than 500 customers, which range from companies with 20,000 employees to companies with only 2-3 employees.

3. E-commerce implementation in BHP Steel

The use of information technology in BHP is not “new”— computers and their applications have been important to BHP Steel since the early 1970s in a number of departments. In general, however, these computer applications were being used within a department rather than being linked to other departments.

The use of computers for business transactions or E-commerce with appropriate standardised documents, which we know as EDI, began in the 1980s when the company realised that electronic trading could provide it with a competitive edge. Figure 4.2 shows the record of E-commerce implementation in BHP Steel that we discuss in this study.
E-commerce implementation in BHP Steel can be divided into four major phases that have been and are being undertaken in the company:

- **Early implementation**: This was the first implementation of electronic trading in BHP Steel, starting around 1986 and ending in 1992, when this project was merged with the integrated EDI project ETG. The system used in this implementation was a PC-based purchasing system with built-in EDI capabilities, allowing the company to send/receive business documents to/from trading partners (suppliers). This was one of the first EDI implementations in Australia, and at its inception BHP Steel had to experiment in many of the design aspects of the system.

- **Electronic Trading Gateway (ETG)**: This was the biggest E-commerce project undertaken by BHP Steel in terms of effort and resources and involved an attempt by BHP Steel to centralise and integrate all aspects of their supply of steel by means of an electronic gateway. It commenced in 1989-1990 when the initial project had already been underway for some three years. Officially, this project was finalised at the end of 1994, but the diffusion and expansion of this project is still going on with new applications documents, and business units as well as trading partners being added constantly.

- **Bar-coding project**: an extensive study undertaken in 1993 led to a realisation of the benefits that could be achieved from the integration of EDI and bar-coding applications. This study resulted in the bar-coding project, which was a company-wide project, commencing in 1994 and finalised in 1997 with the production of a general implementation guide for the company. Up to the end of 1998, the
implementation of bar-coding was continuing to spread to other divisions and business units.

- **Internet-related implementation** began in 1996, when the rapid growth of Internet Commerce began to affect even the resources sector of the economy. BHP Steel is focusing this delivery mechanism on its smaller trading partners, who find the technical and intellectual infrastructure required for traditional EDI beyond their means. A strategy for this new wave of E-commerce was developed and several business applications have already been made available. A pilot trial of Internet-based transaction has already been undertaken and the implementation continues to grow.

### 4. Discussion

The discussion in this paper is divided into two sections:

- key issues involved in the E-commerce implementations, and
- factors influencing the implementation, associated with the solutions developed by the company to address barriers and obstacles.

#### 4.1. **Key issues in BHP Steel’s E-commerce implementation process**

*Early implementation:* the process of change in this first implementation involved more than just the realisation of an idea. This implementation was, in its time, considered to be at the “bleeding edge” of electronic trading and the company gained significant advantage from the “first mover” effect. A number of issues were identified as significant in affecting this project both positively and negatively, and included lack of management support, lack of technical knowledge and support, and the advantages BHP Steel gained from being the customer, rather than the supplier (the “hub and spoke” argument which has been advanced by many authors concerned with competitive advantage from EDI—see, for example, Swatman 1993). While the first two issues inhibited the process of implementation, the last issue actually facilitated the success of the implementation. Being a major customer helped BHP Steel to achieve its goal (having 80 percent of its suppliers trade electronically) in 18 months.

*The ETG implementation* was a far more significant system, involving an equally significant implementation effort. The Electronic Trading Gateway was viewed as an enabling service to provide the communications and standards infrastructure on which BHP Steel business units could build inter-organisational systems with their customers. The major issues affecting the implementation were:
1. Technology-related issues:
   - Standards problems have been one of the major obstacles to EDI uptake, both within Australia and globally — with a particular issue being industry sector variations in optional data elements. BHP Steel was able to resolve this issue by taking an active role in the development of “Industry guidelines” for the steel industry, which define the “sub-set” of optional data elements to be used for each document, working with the EDI Council of Australia (EDICA) and other industry and government bodies.
   - Immaturity of standards: When the project commenced in 1990, BHP Steel used the U.S. ANSI X12 standards, which were then the most widely used, but supported the international UN/EDIFACT standards and gradually migrated to these standards as their level of acceptance and usability increased.

2. Management and business related issues:
   - Customer involvement: being, in this case, the supplier rather than the customer, BHP Steel found that market penetration of the ETG was more difficult than they had anticipated. Suppliers are far more likely to take up a new initiative than customers, who have no real requirement to participate. This barrier can be summarised as being related to cost, culture (or resistance to change), failure to understand the benefits (lack of knowledge) and inability to justify the costs of compliance with the ETG.
   - Business process reengineering: a more positive experience occurred during the implementation of the Steel Test Certificates, which are legally required documents with every sale of steel products. BHP Steel, realising that these documents could not be distributed via the Gateway until the underlying paper document had been standardised, actively promoted the development of standard, A4 document type which lent itself to electronic transmission. Quite independently of the uptake of the Gateway, these certificates have proved immensely successful within the industry.
   - Increase the number of applications and documents to lower the cost per document exchange: The ETG system has been a huge investment for BHP Steel a huge investment and BHP Steel believed that the costs of the system could be recovered in a few years time. However, this did not happen. The need to fully utilise the system by having more documents and applications processed is crucial to recover the cost. At the moment, the cost of transaction is $1.50 per document, which is considered to be above the average rate of standard electronic document exchange ($1.00). Increasing the number of applications and documents means trying to get more trading partners and units involved, and this is not an easy task.
This very brief discussion can only give a superficial impression of the issues which BHP Steel faced during the implementation of the ETG. Other technical issues, such as response times for EDI documents, availability of the Gateway, problems associated with trading partner agreements, legal aspects of EDI, connection to third party networks, audit trails and archives and connection to overseas customers also played a role in making this one of the most complex E-commerce implementations ever attempted in Australia (see Swatman 1993 for more detail on this implementation).

Bar-coding and scanning technologies are a two-edged sword. While they have the potential to significantly reduce costs and speed processing along the supply chain when well-implemented and widely accepted, the required investment in technology means that less successful implementations pose the risk of actually increasing costs. To ensure a smooth implementation. It is essential to have good management and planning as well as the involvement of all affected personnel (usually by including union representatives in working parties). Although this project was far less demanding technically than the ETG, a number of technical issues (such as labeling of steel products in hot condition, the use of fixed bar-code readers on mobile equipment; and standard locations for labels to assist handling automation) arose during the implementation process. Business-related issues were largely confined to the cost of the technology (scanner and other equipment related costs) compared with the benefits to be obtained from their use.

Internet-related E-commerce is the most recent E-commerce implementation in BHP Steel. This project was set up in response to the need to cater for smaller customers and suppliers who found the cost and inconvenience of traditional EDI too great. The major issues in this Internet-related application are associated with the immaturity of the standards used for Internet transactions and the readiness of third parties to handle the implementation. Although the cost of the applications (software) is still a major issue, BHP Steel believes that in the near future this issue will be resolved.

4.2. Factors influencing the implementation process

In a previous paper (Chan and Swatman, 1998), we summarised the factors influencing the process of EDI implementation on the basis of existing work into IS. implementation. In that paper we argued that a real case study would enrich our understanding of the implementation process and could even present a more comprehensive picture of the implementation process. In this section, we present a number of factors influencing the implementation process in BHP Steel.

- Commitment; Commitment has been identified in many information technology implementations (Lucas 1986) as the major factor influencing the success of the implementation. In E-commerce implementation, too, the BHP Steel case shows that
commitment can be identified as one of the significant factors contributing to the progress of the implementation. BHP Steel believed that without commitment it would be impossible to successfully conclude an implementation. As an example, the company’s first international pilot, the APEC international electronic trading project, was very successful. This pilot involved BHP Steel, its New Zealand partner Fletcher Steel, Customs authorities in both Australia and New Zealand, and the shipping agent Seatrans in both countries. This project has been identified as being a major catalyst for EDI within the New Zealand steel industry, as well as providing a boost for the use of EDIFACT in the Australasian region. The commitment of other steel suppliers in NZ was achieved through the establishment of a New Zealand EDI Association (NZEDIA) and a Steel Industry Working Group which provides a local industry network of suppliers and customers focusing on EDI.

- **Trading partner participation**: E-commerce, by definition, is about electronic trading between companies. The participation of trading partners is vital to the success of the implementation. In the early implementation, BHP Steel started its implementation pilot with its 12 trading partners, which were chosen on the basis of location, good relationship, and long term contracts. The same criteria were used when selecting trading partners in the ETG project and later in the E-commerce project. This good relationship and trust that both parties will work together for the success of the implementation has proven very important.

- **Supplier vs. customer**: As BHP Steel discovered during the ETG implementation, however, good trading partner relationships could not overcome the disadvantage of being a supplier-implementor. While customers (particularly large customers) are in a strong position to dictate to their suppliers, the reverse is not true. Even after developing customer-oriented applications and assisting customers with cost/benefit analyses and training, the uptake of the ETG continued to be disappointing.

- **Pro-active approach**: Implementation of E-commerce systems is quite different from implementation of intra-organisational information technologies. The need to market the concept and persuade trading partners to get involved is critical. BHP Steel found that multiple approaches to trading partners were required before agreement was given to trade electronically. One of the managers involved said that BHP Steel had to knock on doors actively and chase their trading partners to become involved in implementation. Success in E-commerce implementation is dependent on other parties, so that without a proactive approach, it is quite impossible to get other parties involved.
• **Technology and media hype:** The hype of EDI in 1990 and the Internet in 1996 played an important part in bringing about the various BHP Steel E-commerce implementations. In 1990, it was argued in both academic and business literature that EDI would take the world by storm and would provide enormous benefits in all industry sectors (Meier 1992). These claims proved to be somewhat exaggerated, but led to the uptake of EDI in a number of industry sectors, including automotive and retail. In 1995, similar claims began to be advanced for Internet Commerce (E-commerce over the Internet) (Horback 1995). BHP Steel as one of main players in the Steel industry was affected by this climate of enthusiasm for the new technologies. The ETG implementation was started in 1991 when companies in the US were busy discussing EDI and the benefits it could bring. One of its customers (the major automotive manufacturer, Ford) became very involved in EDI implementation and BHP wanted to be the supplier that was “easy to trade with”. The same phenomenon occurred again when the Internet “bubble” appeared to offer high transaction volumes at very low prices. Although the EDI hype has not fulfilled its potential, current business activity suggests that Internet Commerce may well be more successful.

• **Business value:** businesses are most concerned with the benefits that E-commerce can bring — what level of savings can be expected? In the case of BHP Steel’s early EDI implementation, most trading partners believed that EDI implementation would bring real benefits to their company. Although the ETG implementation has not brought in many external trading partners, BHP Steel has involved its own business units by providing a detailed cost-benefit analysis and is gaining significant business process advantages from the Gateway. In the case of Internet Commerce, the lower cost means that potential trading partners require a less detailed business case — indeed, many smaller companies are attracted to BHP Steel’s latest E-commerce offering by its lower cost structure.

• **Training and educational program:** Training is part of the unfreezing stage (Lewin 1952) in the whole implementation program, where employees are introduced to a new system and encouraged to become involved in improving the system and process. During the ETG project, Electronic Commerce awareness sessions were conducted by the Steel Group and BHP IT, to promote the use of E-commerce solutions across BHP divisions. Later, when the use of the Internet and browser applications became available (1997), the company established an Electronic commerce newsgroup to encourage an E-commerce environment and provide a place for the E-commerce discussion. Another example of the training and educational program conducted in this company is the Bar-coding demonstration
which consist of practical replica of real life supply chain, with an interactive model of a factory, a warehouse and a retail outlet conducted by EAN Australia.

The next two factors are external to BHP Steel, which makes them quite difficult to deal with. These factors exist in most information technology implementations (ie. desktop applications) and play an important role in the success or otherwise of the uptake of new IT.

- **Rapid changes in technology;** The rate of change of the technologies and systems used in information systems applications, as well as the business needs which result from these changes, have forced organisations to modify their business practices and processes increasingly rapidly. The costs associated with technology change are very high and must be included in calculations of the benefits expected from the implementation of new systems (transaction costs saved, etc). BHP Steel has experienced this process of system change many times. For example, the company’s EDI system has changed three times since its first implementation; and BHP Steel is now considering engaging in significant modifications to the ETG system because of its inflexibility in handling document translations (with a new system, it is less expensive to incorporate new trading partners). The rapid changes in technology and systems create issues which must be resolved by BHP Steel:
  - They increase the difficulty of managing the change process that includes new systems briefing and training.
  - They lead to complex cost/benefit considerations. As an example, the ETG system has to be changed or updated after about 9 years in operation and this will cost a lot of money. On the other hand, this system has not yet been fully utilised and the cost savings originally anticipated have not been achieved.

- **Complexity and compatibility (technology and process);** the very nature of E-commerce, which works by linking multiple organisations, tends to lead to complexity of both technology and process. Although technological complexity can be minimized if there is commitment and willingness to work together with trading partners to solve problems as they arise, complex processes can cause an implementation to falter. In E-commerce implementations, issues such as cultural differences and the problems of integrating systems belonging to very different organisations should be carefully considered. BHP Steel had a success story with the APEC international electronic trading project, yet a similar pilot project which involved electronic trading with Japan and the U.S. was a failure. Clearly, the technological issues were less important than the process issues.
5. Summary and conclusions

E-commerce implementation, while unquestionably delivering benefits to organisations, is not an easy task to achieve successfully. Creating a web site on the Internet may be a simple task, but linking all the business processes and transactions to ensure effective electronic trading over the Internet is a different matter.

Our in-depth study of BHP Steel (which has occurred in two quite separate pieces of research projects over an eight year period) has shown that the E-commerce implementation process is not as straightforward as it initially appeared — and as the company would have hoped. There are many hurdles on the path to E-commerce implementation success. We found that factors such as commitment, trading partner participation, proactive approach, technology hype, training and educational program and, more importantly, business value are positively related to implementation success. Two additional factors (technological change and complexity/compatibility) can have a negative impact on the implementation process. Depending on the type of project, these factors vary in their intensity. For example, in the ETG project, all these factors were crucial to the success of the implementation, while for the bar-coding implementation business value, commitment, proactive approach and training/education played the major roles in the implementation.

In the business environment, business value is considered the most important issue. In most cases, people determine the benefits of the implementation in terms of cost savings, frequently ignoring other benefits such as accuracy or speed. The need to show trading partners these benefits and translate them into dollar terms then becomes very important. In the case of the ETG, for example, BHP Steel is trying hard to win over trading partners by providing them with cost benefit analyses and support. The benefits of E-commerce implementation must be justified and if trading volume is not significant, it can be sufficiently difficult to justify the benefits so that the implementation may simply not occur or it may make later implementations more difficult to “sell” to trading partners.

BHP has learnt that E-commerce implementation is not easy. The company’s position as major customer gave them an unrealistic view of how easy it was to create a successful electronic trading system. When they came to implement a major system from a supplier point of view, they discovered just how difficult such an implementation could be, having to accept a decline in trading partner numbers from 96 to 53. Despite its many benefits, the ETG did not improve trading partners relationships — leading to the loss of some such relationships.
The ETG implementation was a very expensive joint venture with Digital Equipment Corporation, who provided both hardware and some of the software. This implementation did not have the same excitement as the initial electronic trading system, perhaps because the commitment did not come equally from both parties to solve problems as they arose. In many ways, the ETG was an ideal system implementation — BHP Steel involved staff at all levels of the organisation, planned carefully and thoroughly and made use of best practice in almost every aspect of the development. Despite this, customers did not rush to take advantage of the many benefits the system offered (and still offers to purchasers of steel products). It is not clear that vision, authority and drive are enough to achieve successful E-commerce implementation — it also requires trading partners who are willing to reengineer their own organisations to take advantage of the opportunities available from such a complex, integrated approach to electronic trading.

Although training and educational opportunities were provided throughout the implementation of BHP Steel’s E-commerce initiatives, the company found that it needed more than this. They realised that the active participation of everyone involved, as well as an understanding of others’ perceptions and expectations are equally important for the success of E-commerce implementation.

Overall, the experiences of this major, four-part E-commerce implementation has brought a new perspective to BHP Steel’s attitude to E-commerce. They realise that being the leader in the E-commerce implementation has cost them a lot of money and energy — and that quite possible being the leader in the newest of new technology is not the best position for a company whose core business is the production of steel and steel products. It would be more satisfactory for them to work together with other companies interested in implementing the new technology.

BHP Steel’s experience is, of course, unique. But there are many other large, primary sector organisations around the world which have become involved in major E-commerce implementations. Indeed, many of BHP Steel’s experiences would be equally applicable to companies within the manufacturing sector (automotive manufacturers, for example, are both supplier and customer — and would find much to learn from BHP Steel’s adventures). We believe that this study, which forms part of a larger research project investigating the implementation process for E-commerce, offers both insights and experiences to researchers and practitioners in the field of E-commerce.
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References


